

**B.Sc. Semester-VI
Organic Chemistry
Paper-XIV**



1. Amino Acids, Peptides, Proteins and Nucleic Acids

Coverage:

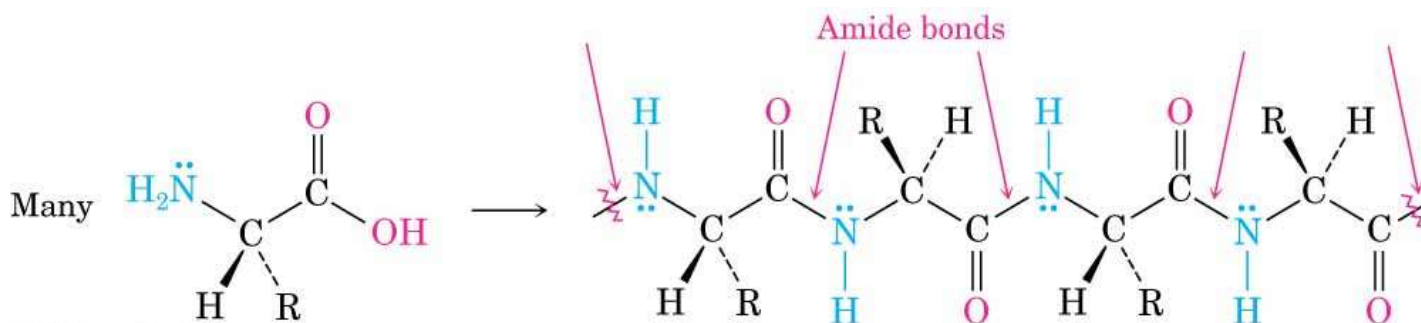
1. Amino Acids and Peptides-2



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Dr. Shyama Prasad Mukherjee University, Ranchi**

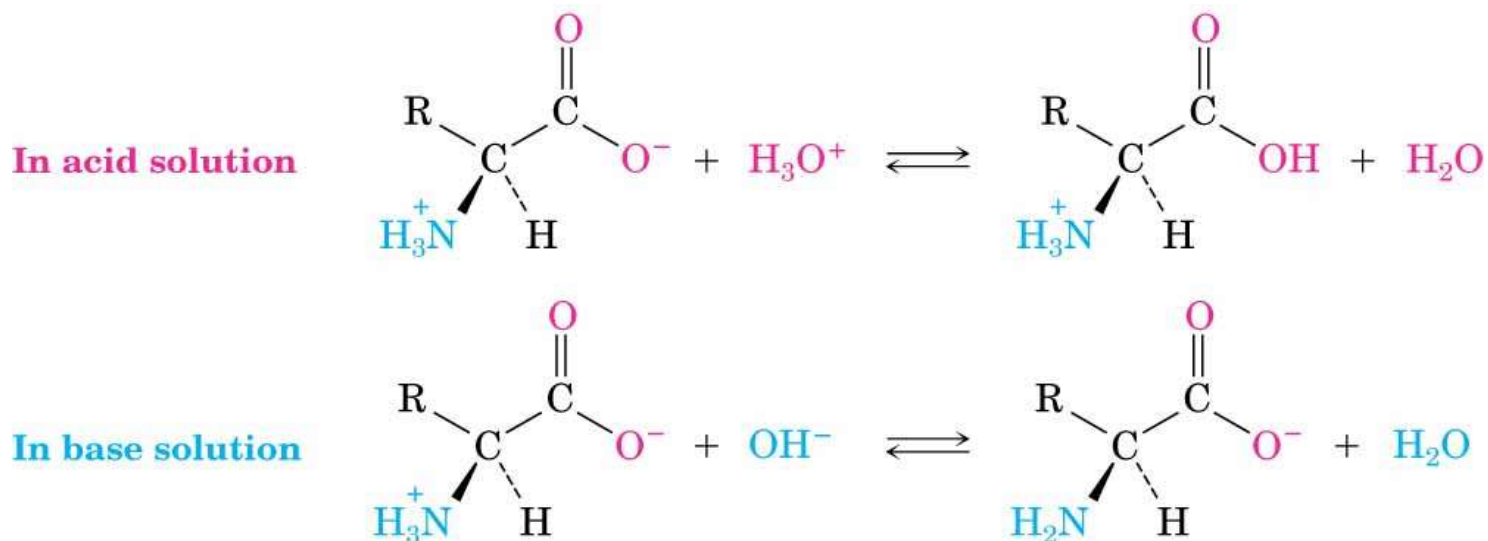
Amides from Amino Acids

- Amino acids contain a basic amino group and an acidic carboxyl group
- Joined as amides between the —NH_2 of one amino acid and the $\text{—CO}_2\text{H}$ the next
- Chains with fewer than 50 units are called peptides
- Protein: large chains that have structural or catalytic functions in biology



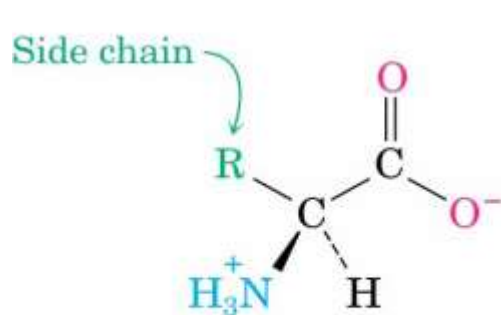
Structures of Amino Acids

- In neutral solution, the COOH is ionized and the NH₂ is protonated
- The resulting structures have “+” and “-” charges (a *dipolar ion*, or *zwitterion*)
- They are like ionic salts in solution

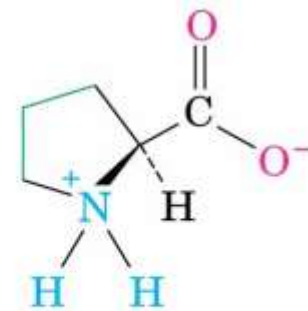


The Common Amino Acids

- 20 amino acids form amides in proteins
- All are α -amino acids - the amino and carboxyl are connected to the same C
- They differ by the other substituent attached to the α carbon, called the side chain, with H as the fourth substituent except for proline
- Proline, is a five-membered secondary amine, with N and the α C part of a five-membered ring



A primary α -amino acid



Proline, a secondary α -amino acid

Abbreviations and Codes

Alanine **A, Ala**

Arginine **R, Arg**

Asparagine **N, Asn**

Aspartic acid **D, Asp**

Cysteine **C, Cys**

Glutamine **Q, Gln**

Glutamic Acid **E, Glu**

Glycine **G, Gly**

Histidine **H, His**

Isoleucine **I, Ile**

Leucine **L, Leu**

Lysine **K, Lys**

Methionine **M, Met**

Phenylalanine **F, Phe**

Proline **P, Pro**

Serine **S, Ser**

Threonine **T, Thr**

Tryptophan **W, Trp**

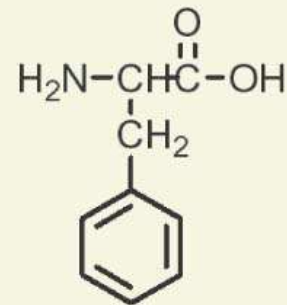
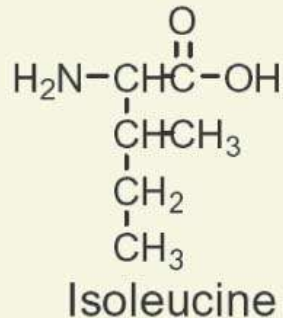
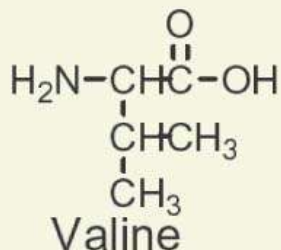
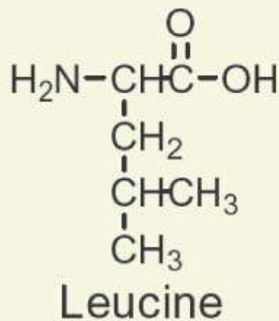
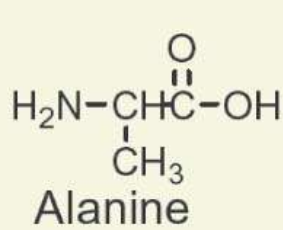
Tyrosine **Y, Tyr**

Valine **V, Val**

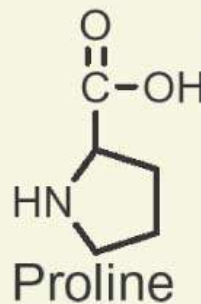
Learning the Names and Codes

- The **names** are not systematic so you learn them by using them (They become your friends)
- One letter codes – learn them too
 - If **only one** amino acid begins with that letter, use it (**C**ys, **H**is, **I**le, **M**et, **S**er, **V**al)
 - If **more than one** begins with that letter, the more common one uses the letter (**A**la, **G**ly, **L**eu, **P**ro, **T**hr)
 - For the others, some are phonetic: **F**enylalanine, **aR**ginine, **tY**rosine
 - Tryp has a *double* ring, hence **W**
 - Amides have letters from the middle of the alphabet (**Q** – Think of “**Q**tamine” for glutamine; asparagine -contains **N**)
 - “Acid” ends in **D** and **E** follows (smallest is first: aspartic aci**D**, Glutamic acid **E**)

Neutral Hydrocarbon Side Chains

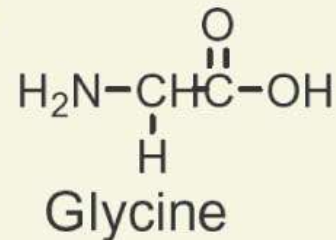


Phenylalanine



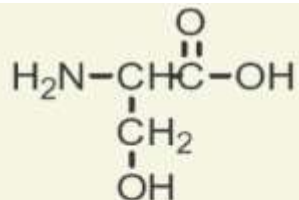
Proline

Alanine **A, Ala**
 Glycine **G, Gly**
 Isoleucine **I, Ile**
 Leucine **L, Leu**
 Phenylalanine **F, Phe**
 Proline **P, Pro**
 Valine **V, Val**

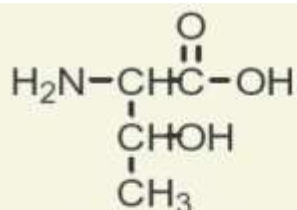


Glycine

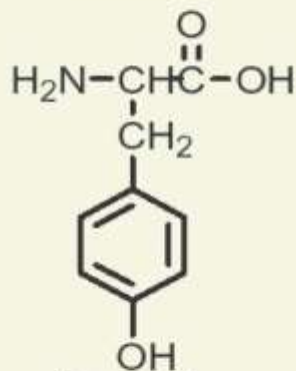
-OH, SH (Nucleophiles) and -S-CH₃



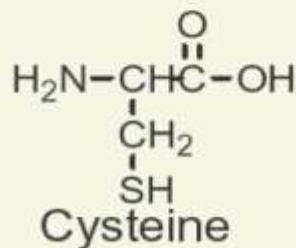
Serine



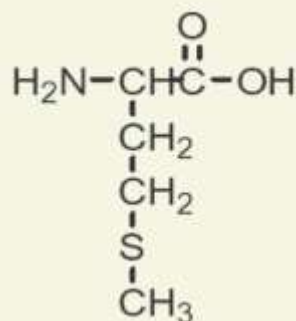
Threonine



Tyrosine



Cysteine



Methionine

Cysteine **C, Cys**

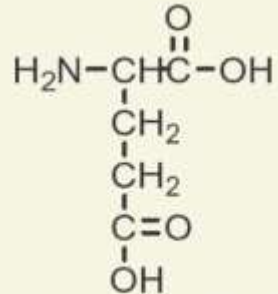
Methionine **M, Met**

Serine **S, Ser**

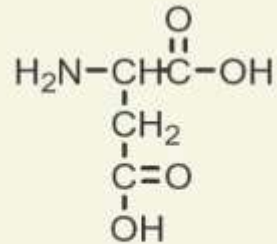
Threonine **T, Thr**

Tyrosine **Y, Tyr**

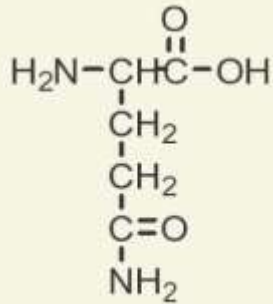
Acids and Amides



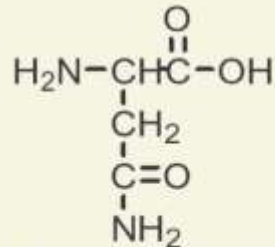
Glutamic Acid



Aspartic Acid



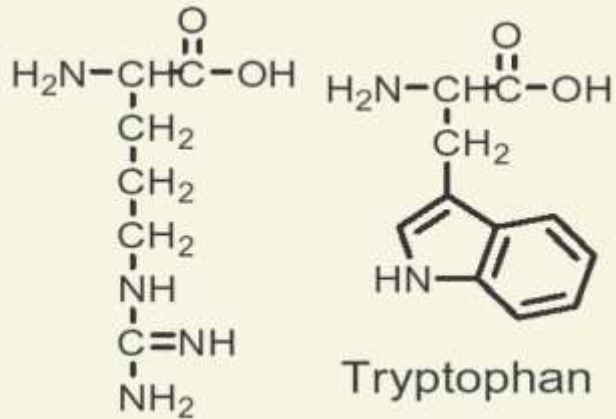
Glutamine



Asparagine

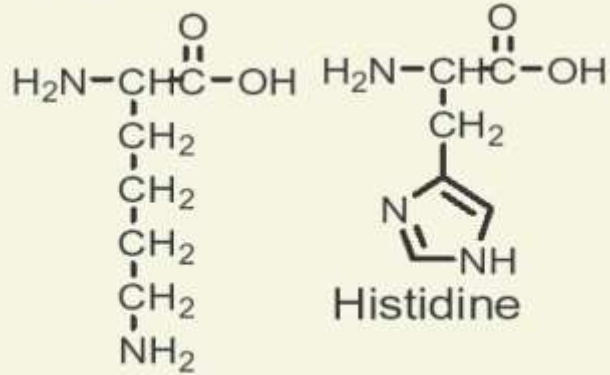
Aspartic acid **D, Asp**
Glutamic Acid **E, Glu**
Asparagine **N, Asn**
Glutamine **Q, Gln**

Amines



Arginine

Tryptophan



Lysine

Histidine

Arginine **R, Arg**

Histidine **H, His**

Lysine **K, Lys**

Tryptophan **W, Trp**